AK725

Dalang Communication Technology Co., Ltd Product Specification

Product Name:	**GNSS Receiver**
Product Model:	AK725
Version Number:	V 1.0
Revision Date:	2024.05.22

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1 Product Application Scenarios

The AK725 model BeiDou/GPS/Galileo/GLONASS four-constellation dual-frequency RTK integrated module (referred to as the module) is an ultra-low-cost, low-power, high-performance real-time kinematic (RTK) differential positioning module. This module's highly reliable carrier phase differential technology provides real-time centimeter-level positioning accuracy for drones, automobiles, and surveying users. See Figure 1for details.

Figure 1 Product Application Scenarios

2 Features

In this chapter, we will delve into and comprehensively elaborate on the functionalities and operating principles of the AK725, detailing how it plays a pivotal role in various applications as follows:

1. **Stable High-Frequency Performance:** Based on the Beiyun M20 series design, the module can achieve stable and high-precision positioning results even in harsh environments.
2. **Fast:** Supports Beidou/GPS/Galileo/GLONASS four-constellation joint RTK solution, offering fast and reliable initialization capabilities.
3. **High Data Output:** Support up to 10Hz data output, meeting the requirements for applications in dynamic drone environments.
4. **Interference Resistance:** Effectively resists interference from other electronic devices, ensuring clear and accurate positioning signals.
5. **Compatibility:** Fully compatible with Pixhawk and APM flight control systems, ensuring excellent compatibility.
6. **Low Noise:** Utilizes industrial-grade low-noise RF circuitry, providing strong multipath suppression.
7. **High-Precision Magnetometer:** Integrates the industrial-grade iSentek IST8310 magnet ometer, offering additional directional support and enhancing the overall accuracy and sta bility of the navigation system, especially and direction measurements.

3 Structural Characteristic

In this section, we will conduct an in-depth analysis of the product's design details, presenting its aesthetic features and precise interface specifications through detailed structural diagrams. This perspective aims to provide a comprehensive framework, thereby enhancing the understanding and perception of the product's architecture. Refer to Figure 2, Table 1.

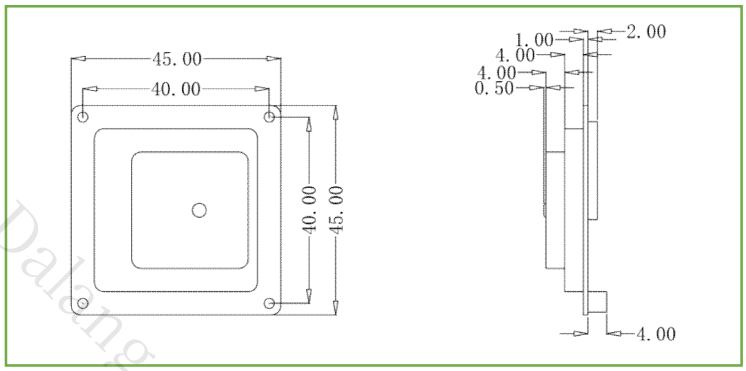


Figure 2 Schematic Diagram

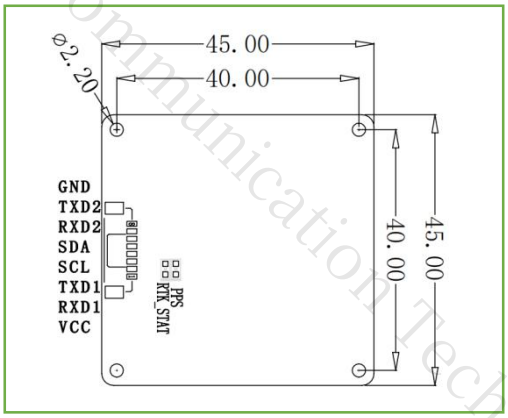


Table 1 PIN Function

NO.	Signal Name	Signal Description
1	VCC	Main power supply input, +3.3V to +5V
2	RXD1	First serial receive data pin, used for receiving serial date streams.
3	TXD1	First serial transmit data pin, used for receiving serial date streams.
4	SCL	Clock line in the l2C communication protocol, used for synchronizing data transfer.
5	SDA	Data line in the l2C communication protocol, used for bidirectional data transfer.
6	RXD2	Serial receive data pin, similar to RXD1, used for receiving another serial data stream.
7	TXD2	Serial transmit data pin, similar to TXD1, used for sending another serial data stream.
8	GND	Ground pin, used for connecting to the circuit's ground, providing the reference voltage needed for the circuit loop.
Note: Typically, VCC and GND are used for power supply, TX and RX are used for serial communication, while SCL and SDA are used for I²C communication. These interfaces allow the receiver to exchange power supply and data with external devices.		

4 Specifications

In this section, we will provide a detailed list and explanation of the product's chip features, sensitivity, accuracy, operating principles, and other technical details, as detailed in Table 2.

Table 2 Product Specifications

Chip characteristics	working frequency	BDS：B1l、 B2l、B3l、B1C、B2a、B2b GPS：L1 C/A、L1C、L2、L5 GLO：G1、G2 GAL：E1、E5a、E5b、E6 QZSS：L1 C/A、L1C、L2、L5、L6 (CLAS) NavlC：L5 SBAS*：L1 C/A			
	chip	Beiyun M20			
	Receiving channel	1507 channel			
Time To First Fix	cold boot	≤30s			
	Hot start	≤5s			
	Re capture	≤1s			
	RTK initialization	≤ 5 s			
Accuracy	Horizontal positioning accuracy	Single point: 1.5mCEP			
		RTK：1.0 cm + 1 ppmCEP			
	Elevation positioning accuracy	Single point: 2.5mCEP			
		RTK：1.5 cm + 1 ppmCEP			
	Observation accuracy (RMS)	BDS	GPS	GLO	GAL
	B1I/B1C/L1C/L1 CA/E1/G1 pseudorange	10cm	10cm	10cm	10cm
	B1I/B1C/L1C/L1 CA/E1/G1 Carrier Phase	1mm	1mm	1mm	1mm
	B2I/B2a/B2b/L5/E5a/E5b pseudorange	10cm	10cm	10cm	10cm
	B2I/B2a/B2b/L5/E5a/E5b	1mm	1mm	1mm	1mm

	Carrier Phase				
	B3I/L2/G2 pseudorange	10cm	10cm	10cm	10cm
	B3I/L2/G2 Carrier Phase	1mm	1mm	1mm	1mm
	Speed accuracy	0.03m/s			
	Timing accuracy	≤20 ns			
Output data	Baud rate	115200bps（default）			
	Output interface	TTL			
	Output Protocol	NMEA,RTCM3.3, BYNAV			
	update frequency	Default 1Hz（1Hz-10Hz）			
	Carrier phase output	Support, output RAWX statement			
	FLASH	built-in			
Working conditions	speed	＜550m/s			
	Gravitational acceleration	＜4g			
Environment	working temperature	-40℃-85℃			
	Storage temperature	-40℃-85℃			
Electrical specifications	working voltage	3V~5.5V DC			
	power waste	＜800mW@3.3V			
Physical parameters	size	45*11.5mm			
	weight	35.8g			
	Connector	GH1.25mm 8pin			

5 Product Photos

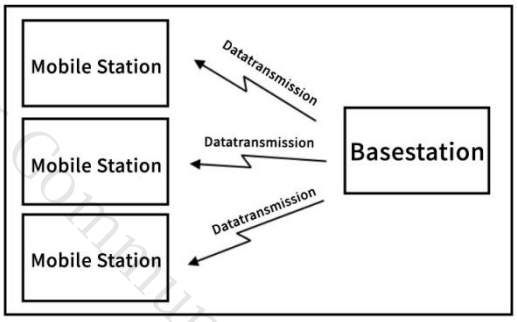
In this chapter, we will showcase real-life images of the product, as shown in Figure 4. These images provide a detailed view of our product from various angles and perspectives. We believe that through authentic representation, we can better convey the value and concept of the product, thereby enhancing your trust and satisfaction.

Figure 4 Product Images

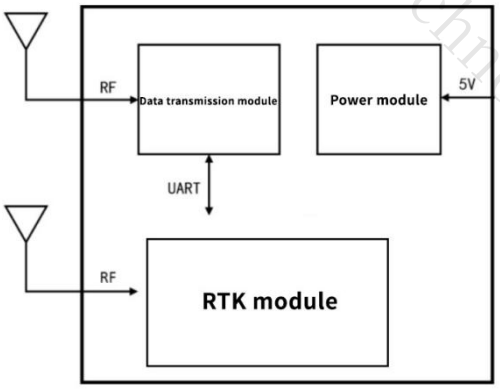
6 Typical Applications

6.1 Application of high-precision positioning for medium and short distances

In high-precision positioning applications for medium to short distances (<3km), the module can be combined with a data transmission module to form a complete high-precision positioning system with only a small amount of external circuits. It is suitable for applications with a large number of mobile stations in a small range, and the module is fully compatible with other automatic flight control systems such as Pixhawk and APM. The schematic diagram is as follows:



The reference station is stationary and fixed, and differential data is broadcasted to all mobile stations through a data transmission module. The circuit diagrams of the mobile station and the reference station are as follows:



3) If the antenna coordinates have been accurately determined through other surveying methods, please use the # set position command to input the antenna coordinates into the reference station module in latitude, longitude, and altitude format;

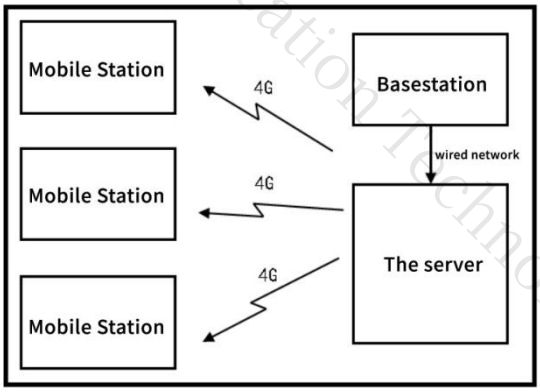
4) If the antenna coordinates are unknown, please wait patiently for about 5 minutes. The module will calculate the antenna position as accurately as possible. After the calculation is c

ompleted, the differential data port will begin to output data. At this point, the base station has already recorded the coordinates and broadcasted them wirelessly to ensure that the base station does not lose power, as the coordinates will be recalculated after a power outage and the repeatability of the mobile station measurement points cannot be guaranteed;

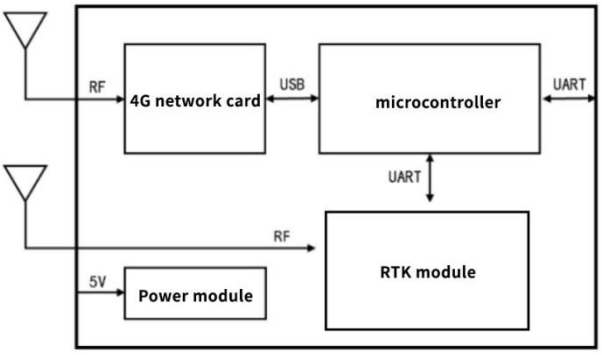
5) Install the mobile station antenna on the mobile carrier, confirm receipt of differential data, and wait for about 120 seconds to obtain high-precision positioning results.

6.2 Application of Medium to Long Range High Precision Positioning

In the application of high-precision positioning over medium to long distances (<10km), common data transmission modules are difficult to provide reliable differential data connections and suffer from serious packet loss problems. For this purpose, the company provides a solution based on 4G network (as shown in the figure below). The benchmark station sends differential data to the server through a wired network and is cached by the server. Mobile stations access servers through 4G networks to obtain differential data. This solution can greatly expand the coverage area of base stations, and mobile stations equipped with 4G network cards can simultaneously transmit positioning results back to designated servers.



The circuit diagram of the mobile station is as follows:



In practical applications, the number of mobile stations that a server can access simultaneously is limited only by server performance and is more suitable for a large number of users. Requirements between the server and the base station: the server can be directly accessed from the public network (with a public IP address), and a network connection can be established between the base station and the server (either through the public network or local area network).

6.3 High precision positioning application without reference station

In high-precision positioning applications without reference stations, the module needs to cooperate with the 4G communication module to obtain differential data. We provide Qianxun with differential data sources nationwide, and users can obtain high-precision positioning results without deploying base stations. The circuit diagram is as follows: